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1 Level set and PDE methods for computer graphics

David Breen, Ron Fedkiw, Ken Museth, Stanley Osher, Guillermo Sapiro, Ross Whitaker
August 2004 ACM SIGGRAPH 2004 Course Notes SIGGRAPH '04


Publisher: ACM Press

 Full text available: [pdf\(17.07 MB\)](#) Additional Information: [full citation](#), [abstract](#), [citations](#)

Level set methods, an important class of partial differential equation (PDE) methods, define dynamic surfaces implicitly as the level set (iso-surface) of a sampled, evolving nD function. The course begins with preparatory material that introduces the concept of using partial differential equations to solve problems in computer graphics, geometric modeling and computer vision. This will include the structure and behavior of several different types of differential equations, e.g. the level set eq ...

2 An optimal algorithm for intersecting line segments in the plane


Bernard Chazelle, Herbert Edelsbrunner
January 1992 Journal of the ACM (JACM), Volume 39 Issue 1

Publisher: ACM Press

 Full text available: [pdf\(3.84 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

The main contribution of this work is an $O(n \log n + k)$ -time algorithm for computing all k intersections among n line segments in the plane. This time complexity is easily shown to be optimal. Within the same asymptotic cost, our algorithm can also construct the subdivision of the plane defined by the segments and compute which segment (if any) lies right above (or below) each intersection ...

3 Improved implementations of binary universal operations


Hagit Attiya, Eyal Dagan
September 2001 Journal of the ACM (JACM), Volume 48 Issue 5

Publisher: ACM Press

 Full text available: [pdf\(229.13 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We present an algorithm for implementing binary operations (of any type) from unary *load-linked* (LL) and *store-conditional* (SC) operations. The performance of the algorithm is evaluated according to its *sensitivity*, measuring the distance between operations in the graph induced by conflicts, which guarantees that they do not influence the step complexity of each other. The sensitivity of our implementation is $O(\log^{\ast} n)$, where n is the numb ...

Keywords: Asynchronous shared-memory systems, contention-sensitive algorithms, deterministic coin tossing, load-linked/store-conditional operations, universal operations, wait-free algorithms

4 On randomization in sequential and distributed algorithms



Rajiv Gupta, Scott A. Smolka, Shaji Bhaskar

March 1994 **ACM Computing Surveys (CSUR)**, Volume 26 Issue 1

Publisher: ACM Press

Full text available: pdf(8.01 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Probabilistic, or randomized, algorithms are fast becoming as commonplace as conventional deterministic algorithms. This survey presents five techniques that have been widely used in the design of randomized algorithms. These techniques are illustrated using 12 randomized algorithms—both sequential and distributed—that span a wide range of applications, including: primality testing (a classical problem in number theory), interactive probabilistic proof s ...

Keywords: Byzantine agreement, CSP, analysis of algorithms, computational complexity, dining philosophers problem, distributed algorithms, graph isomorphism, hashing, interactive probabilistic proof systems, leader election, message routing, nearest-neighbors problem, perfect hashing, primality testing, probabilistic techniques, randomized or probabilistic algorithms, randomized quicksort, sequential algorithms, transitive tournaments, universal hashing

5 Join algorithm costs revisited



Evan P. Harris, Kotagiri Ramamohanarao

January 1996 **The VLDB Journal — The International Journal on Very Large Data Bases**, Volume 5 Issue 1

Publisher: Springer-Verlag New York, Inc.

Full text available: pdf(329.00 KB) Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)

A method of analysing join algorithms based upon the time required to access, transfer and perform the relevant CPU-based operations on a disk page is proposed. The costs of variations of several of the standard join algorithms, including nested block, sort-merge, GRACE hash and hybrid hash, are presented. For a given total buffer size, the cost of these join algorithms depends on the parts of the buffer allocated for each purpose. For example, when joining two relations using the nested block j ...

Keywords: Join algorithms, Minimisation, Optimal buffer allocation

6 External memory algorithms and data structures: dealing with massive data



Jeffrey Scott Vitter

June 2001 **ACM Computing Surveys (CSUR)**, Volume 33 Issue 2

Publisher: ACM Press

Full text available: pdf(828.46 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Data sets in large applications are often too massive to fit completely inside the computers internal memory. The resulting input/output communication (or I/O) between fast internal memory and slower external memory (such as disks) can be a major performance bottleneck. In this article we survey the state of the art in the design and analysis of external memory (or EM) algorithms and data structures, where the goal is to exploit locality in order to reduce the I/O costs. We consider a varie ...

Keywords: B-tree, I/O, batched, block, disk, dynamic, extendible hashing, external memory, hierarchical memory, multidimensional access methods, multilevel memory, online, out-of-core, secondary storage, sorting

7 Functional dependencies in Horn clause queries

Alberto O. Mendelzon, Peter T. Wood

March 1991 **ACM Transactions on Database Systems (TODS)**, Volume 16 Issue 1

Publisher: ACM Press

Full text available:  pdf(1.64 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

When a database query is expressed as a set of Horn clauses whose execution is by top-down resolution of goals, there is a need to improve the backtracking behavior of the interpreter. Rather than putting on the programmer the onus of using extra-logical operators such as cut to improve performance, we show that some uses of the cut can be automated by inferring them from functional dependencies. This requires some knowledge of which variables are guaranteed to be bound at ...

Keywords: data flow analysis, functional dependency, logic programming, relational database

8 HIDE: an infrastructure for efficiently protecting information leakage on the address

bus

Xiaotong Zhuang, Tao Zhang, Santosh Pande

October 2004 **ACM SIGPLAN Notices , ACM SIGOPS Operating Systems Review , ACM SIGARCH Computer Architecture News , Proceedings of the 11th international conference on Architectural support for programming languages and operating systems ASPLOS-XI**, Volume 39 , 38 , 32 Issue 11 , 5 , 5

Publisher: ACM Press

Full text available:  pdf(216.31 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

XOM-based secure processor has recently been introduced as a mechanism to provide copy and tamper resistant execution. XOM provides support for encryption/decryption and integrity checking. However, neither XOM nor any other current approach adequately addresses the problem of information leakage via the address bus. This paper shows that without address bus protection, the XOM model is severely crippled. Two realistic attacks are shown and experiments show that 70% of the code might be cracked ...

Keywords: address bus leakage protection, secure processor

9 Research sessions: stream QP: Dynamic plan migration for continuous queries over

data streams

Yali Zhu, Elke A. Rundensteiner, George T. Heineman

June 2004 **Proceedings of the 2004 ACM SIGMOD international conference on Management of data SIGMOD '04**

Publisher: ACM Press

Full text available:  pdf(282.13 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Dynamic plan migration is concerned with the on-the-fly transition from one continuous query plan to a semantically equivalent yet more efficient plan. Migration is important for stream monitoring systems where long-running queries may have to withstand fluctuations in stream workloads and data characteristics. Existing migration methods generally adopt a pause-drain-resume strategy that pauses the processing of new data, purges all old data in the existing plan, until finally the new plan can b ...

10 Adaptive rank-aware query optimization in relational databases

 Ihab F. Ilyas, Walid G. Aref, Ahmed K. Elmagarmid, Hicham G. Elmougui, Rahul Shah, Jeffrey Scott Vitter

December 2006 **ACM Transactions on Database Systems (TODS)**, Volume 31 Issue 4

Publisher: ACM Press

Full text available:  pdf(1.48 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Rank-aware query processing has emerged as a key requirement in modern applications. In these applications, efficient and adaptive evaluation of top- k queries is an integral part of the application semantics. In this article, we introduce a rank-aware query optimization framework that fully integrates rank-join operators into relational query engines. The framework is based on extending the System R dynamic programming algorithm in both enumeration and pruning. We define ranking as an int ...

Keywords: Advanced query processing, adaptive processing, rank-aware optimization, ranking, top- k

11 A data locality optimizing algorithm

 Michael E. Wolf, Monica S. Lam

May 1991 **ACM SIGPLAN Notices , Proceedings of the ACM SIGPLAN 1991 conference on Programming language design and implementation PLDI '91**, Volume 26

Issue 6

Publisher: ACM Press

Full text available:  pdf(1.54 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

12 Multiple-view geometry for image-based modeling

 Jana Košecká, Yi Ma, Stefano Soatto, René Vidal

August 2004 **ACM SIGGRAPH 2004 Course Notes SIGGRAPH '04**

Publisher: ACM Press

Full text available:  pdf(23.14 MB) Additional Information: [full citation](#), [abstract](#)

This course presents the state of the art in multiple-view geometry, including methods and algorithms for reconstructing 3-D geometric models of scenes from video or photographs. This course is based on a novel approach to multiple-view geometry that only requires linear algebra, as opposed to more involved projective and algebraic geometry that most current methods employ. This new approach aims to make image-based modeling techniques accessible to a larger audience compared to existing ones. T ...

13 Optimization of join operations in horizontally partitioned database systems

 Arie Segev

March 1986 **ACM Transactions on Database Systems (TODS)**, Volume 11 Issue 1

Publisher: ACM Press

Full text available:  pdf(1.74 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper analyzes the problem of joining two horizontally partitioned relations in a distributed database system. Two types of semijoin strategies are introduced, local and remote. Local semijoins are performed at the site of the restricted relation (or fragment), and remote semijoins can be performed at an arbitrary site. A mathematical model of a semijoin strategy for the case of remote semijoins is developed, and lower bounding and heuristic procedures are proposed. The results of comp ...

14**Improved Parameterized Complexity of the Maximum Agreement Subtree and Maximum Compatible Tree Problems**

Vincent Berry, Francois Nicolas

July 2006 **IEEE/ACM Transactions on Computational Biology and Bioinformatics**

(TCBB), Volume 3 Issue 3

Publisher: IEEE Computer Society Press

Full text available:  pdf(349.36 KB) Additional Information: [full citation](#), [abstract](#), [index terms](#)

Given a set of evolutionary trees on a same set of taxa, the maximum agreement subtree problem (MAST), respectively, maximum compatible tree problem (MCT), consists of finding a largest subset of taxa such that all input trees restricted to these taxa are isomorphic, respectively compatible. These problems have several applications in phylogenetics such as the computation of a consensus of phylogenies obtained from different data sets, the identification of species subjected to horizontal gene t ...

Keywords: Phylogenetics, algorithms, consensus, pattern matching, trees, compatibility, fixed-parameter tractability.

15 Testing: Testing telecoms software with quviq QuickCheck 

 Thomas Arts, John Hughes, Joakim Johansson

September 2006 **Proceedings of the 2006 ACM SIGPLAN workshop on Erlang ERLANG '06**

Publisher: ACM Press

Full text available:  pdf(115.95 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We present a case study in which a novel testing tool, Quviq QuickCheck, is used to test an industrial implementation of the Megaco protocol. We considered positive and negative testing and we used our developed specification to test an old version in order to estimate how useful QuickCheck could potentially be when used early in development. The results of the case study indicate that, by using Quviq QuickCheck, we would have been able to detect faults early in the development. We detected faults ...

Keywords: property based testing, test automation

16 A reduced-power channel reuse scheme for wireless packet cellular networks 

Junyi Li, Ness B. Shroff, K. P. Chong

December 1999 **IEEE/ACM Transactions on Networking (TON)**, Volume 7 Issue 6

Publisher: IEEE Press

Full text available:  pdf(390.76 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

Keywords: capture division packet access, channel reuse, packet cellular networks, power control

17 Ultracomputers 

 Jacob T. Schwartz

October 1980 **ACM Transactions on Programming Languages and Systems (TOPLAS)**,

Volume 2 Issue 4

Publisher: ACM Press

Full text available:  pdf(2.54 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A class of parallel processors potentially involving thousands of individual processing elements is described. The architecture is based on the perfect shuffle connection and has two favorable characteristics: (1) Each processor communicates with a fixed number of other processors. (2) Important communication functions can be accomplished in time proportional to the logarithm of the number of processors. A number of basic algorithms for these "ultracomputers" are presented, and ...

18 New approximation algorithms for graph coloring



 Avrim Blum

May 1994 **Journal of the ACM (JACM)**, Volume 41 Issue 3

Publisher: ACM Press

Full text available:  pdf(2.59 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The problem of coloring a graph with the minimum number of colors is well known to be NP-hard, even restricted to k -colorable graphs for constant $k \geq 3$. This paper explores the approximation problem of coloring k -colorable graphs with as few additional colors as possible in polynomial time, with special focus on the case of $k = 3$. The p ...

Keywords: approximation algorithms, chromatic number, graph coloring

19 Contention-free complexity of shared memory algorithms



 Rajeev Alur, Gadi Taubenfeld

August 1994 **Proceedings of the thirteenth annual ACM symposium on Principles of distributed computing PODC '94**

Publisher: ACM Press

Full text available:  pdf(1.17 MB)

Additional Information: [full citation](#), [references](#), [index terms](#)

20 Reactive provisioning of backend databases in shared dynamic content server



 clusters

Gokul Soundararajan, Cristiana Amza

December 2006 **ACM Transactions on Autonomous and Adaptive Systems (TAAS)**,

Volume 1 Issue 2

Publisher: ACM Press

Full text available:  pdf(928.76 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper introduces a self-configuring architecture for on-demand resource allocation to applications in a shared database cluster. We use a unified approach to load and fault management based on data replication and reactive replica provisioning. While data replication provides scaling and high availability, reactive provisioning dynamically allocates additional replicas to applications in response to peak loads or failure conditions, thus providing per application performance. We design an e ...

Keywords: Autonomic systems, databases, query processing, transactions

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